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March 23, 1998

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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

Via Hand Delivery

Geraldine A. Matise
Chief, Network Services Division
Common Carrier Bureau
Federal Communications Commission
2000 M Street, N.W. - Room 235-A
Washington, D.C. 20554

      Re: **EX PARTE** -- Telephone Number Portability
   CC Docket 95-116

Dear Ms. Matise:

      In response to a request from the Network Services Division staff, below is a
short description of the process in which Lockheed Martin participates, as a Number
Portability Administration Center ("NPAC") services supplier, in the testing and
deployment of local number portability ("LNP") in an area. The process described is a
generic process that has been employed in the four original Lockheed Martin regions
served, and is currently underway for the three additional regions we are presently in the
process of turning up.

      Lockheed Martin notes that this letter is provided solely to present requested
information to the staff and is not intended to comment in any way on pending requests
from various local exchange carriers regarding LNP implementation schedules.
Lockheed Martin emphasizes that the testing intervals described below are based upon
its experience to date with its original four regions and are very rough averages. In
Lockheed Martin's experience the actual amount of testing varies substantially by
carrier, MSA, and region.

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List A B C D E

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A. LNP Testing and Turn-Up Process Overview
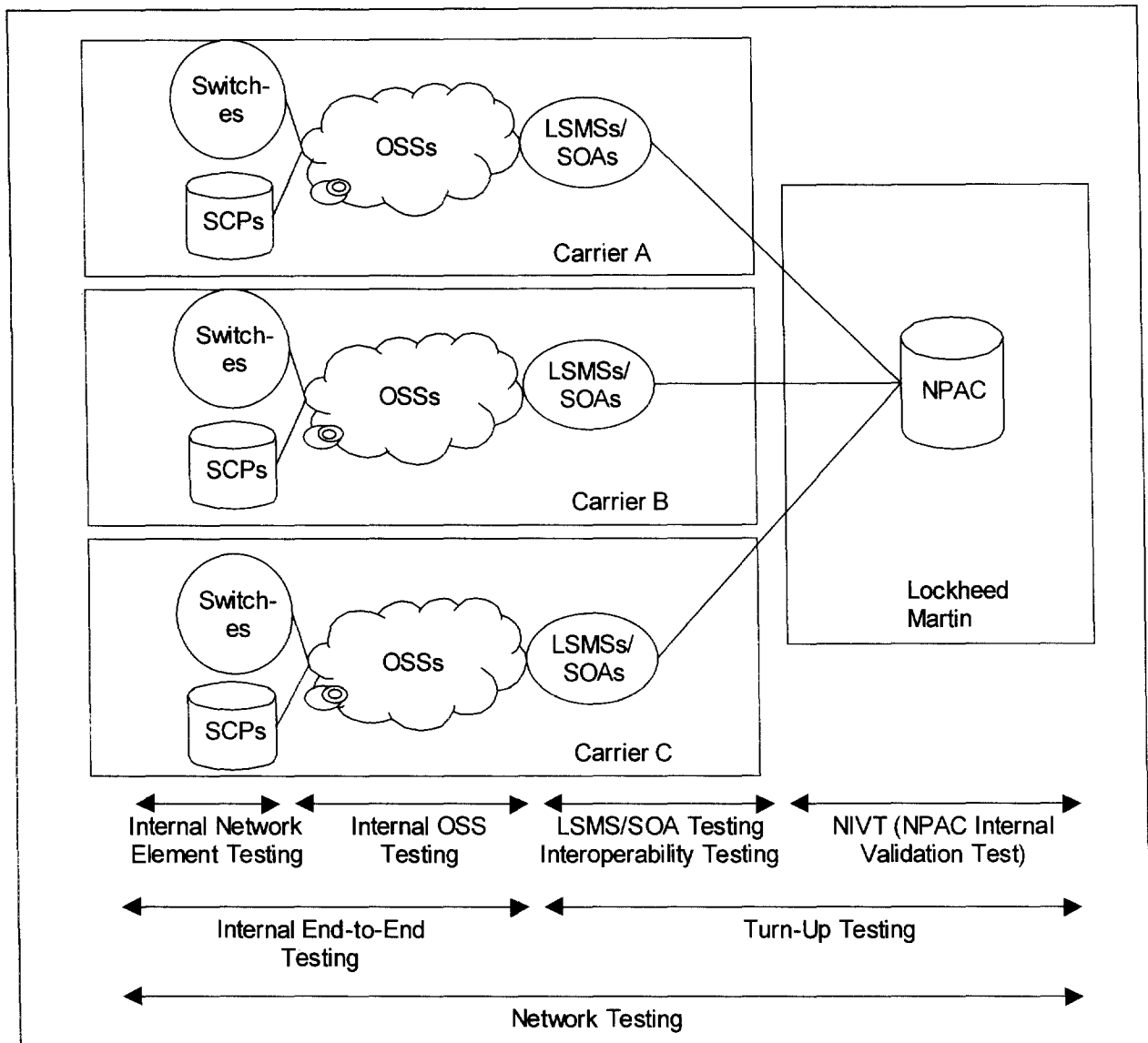
The above diagram provides a highly simplified illustration of an LNP environment from a testing perspective. To the right in the diagram is the NPAC SMS system, provided and operated by Lockheed Martin. The NPAC is connected to specific systems with LNP-participating carriers over a standardized interface. These systems are referenced by the functions they provide, *i.e.,* Local Service Management System

Geraldine A. Matise
March 23, 1998
Page Three

("LSMS") and Service Order Administration ("SOA") system. Physically, there are multiple NPAC systems and potentially one or multiple LSMS/SOA systems (or integrated gateway system providing both functions) for any one carrier. Logically, however, there is only a single NPAC SMS system for each of the regions served. The LSMS/SOA systems in a carrier are typically part of an Operation Support System ("OSS") network, which in turn provide support services for network elements such as switches and LNP Service Control Points ("SCPs").

Below the system connectivity diagram, a number of discrete testing phases are identified. In a systematic testing methodology such as employed for LNP, individual systems are typically first tested and verified in isolation and then tested when interconnected with each other in successively larger phases. Typically, the tests identified in the top row of testing steps are performed first. These steps, such as the internal network element testing, internal OSS testing, LSMS/SOA testing, and NPAC internal validation testing ("NIVT"), can generally be performed independent of each other since these components are tested in isolation during this phase, typically in a lab environment. The testing of systems that are provided as standard products usually is done once per product release, usually by the supplier or developer of that system and verified or reproduced by the customer (*e.g.*, carrier). We have followed a similar internal process for testing the NPAC SMS.

It should be noted that the test steps we've identified in the first phase are illustrative of the types of internal tests typically conducted. The types, names, and sequencing of the various internal test phases are not standardized and so vary by company, supplier, and/or type of system. We mention these test steps only to provide a context for the specific testing involving Lockheed Martin and the NPAC, described in more detail below.

B.   NPAC Testing

Lockheed Martin conducted an extensive series of internal system tests of its NPAC system, culminating in the NIVT, prior to its first release of the NPAC system in May 1997. Subsequent releases of the NPAC have each been subject to internal regression and acceptance testing similar to the NIVT performed on the first release. This internal testing is performed by Lockheed Martin once per new release. After we've completed internal testing of a new release, that release is then subjected to external regression testing conducted by the carriers in each region and by Lockheed Martin. When a release completes external regression testing it is scheduled for deployment on the production NPAC system.

Geraldine A. Matise
March 23, 1998
Page Four

C. Regional NPAC Turn-Up and LNP Testing

A specific testing regimen is employed in each region to verify correct system interoperation prior to designating the NPAC live for that region. Once the NPAC is designated as live for a region, then commercial LNP administration services commence. The LNP database for that region, resident in the NPAC and in carrier networks, is considered live and is subject to NANC LNP business processes and standard methods and practices ("M&Ps"). However, designating LNP as live in a region (commercial porting of subscribers) is a subsequent step after the NPAC is live. Typically, a network testing phase is conducted by the participating carriers once the NPAC is live to verify correct end-to-end interoperation of LNP between the carrier networks.

The process of verifying carrier system functionality and compliance with all applicable specifications leading to certification with the Lockheed Martin NPAC consists of a well defined series of test scenarios developed jointly over the last two years in conjunction with the carriers participating in LNP deployment.

The NPAC certification testing process described below is a required prerequisite for any carrier who wished to connect to a live Lockheed Martin NPAC system for the purpose of participating in the LNP environment. To date, more than a dozen different companies participating in the four original Lockheed Martin LNP regions have successfully progressed through this suite of tests. The certification process is divided into three major sections which must be executed successfully in sequence. The three sections are "Interoperability Testing", "Turn-up Testing" and "Field Trial/Network Testing". Each section is described in more detail below.

D. Interoperability Testing

The "Interoperability Testing" process is the first opportunity that a system developer or carrier is offered to test their SOA and LSMS software for compatibility with the interface specifications that define proper data message exchange with the NPAC. That interface specification is defined by the NANC "Interoperable Interface Specification" ("IIS"), currently at revision level 1.8.

Interoperability testing is a service offered by Lockheed Martin to system developers and carriers to certify their product's compliance with the IIS. A particular LSMS/SOA product need only be interoperability tested once per product release. This certifies that particular product release for compliance with the IIS. Any carrier who deploys a certified LSMS/SOA product need not repeat interoperability testing again for the system, regardless of the number of such systems deployed in their network or the number of regions they serve.

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LOCKHEED MARTIN

Geraldine A. Matise
March 23, 1998
Page Five

Interoperability testing is conducted between the SOA and LSMS platforms (hardware and software) and the Lockheed Martin Interoperability Test Laboratory located in Bridgewater, N.J. Typically the testing is done using dial-up communication links as the testing is functional in nature rather than performance oriented. The interoperability test laboratory uses a suite of NPAC simulator software to provide interaction with the carrier's software that is identical to what will be seen when the carrier is connected to the actual NPAC platform. The interoperability test suite consists of several hundred individual test cases. These test cases are divided into several categories, namely:

- Stack to Stack – a series of tests that verify compliance with the various levels of the OSI protocol stack.
- Security – a series of tests that verify the carriers' ability to establish a secure association (data channel) with the NPAC conforming with the requirements for digital signature verification.
- Managed Object Conformance – a series of tests that verify that the carriers platform and send and receive each of the message types and formats that are defined as part of the current IIS.
- Recovery – test cases that verify the proper operation of the carriers platform when an association is lost then reestablished.
- Application to Application – a series of test cases that test and verify end-to-end message flows corresponding to LNP business cases.

Total time required to execute the interoperability test suite is typically 8 weeks. If problems are encountered with the testing, those failed test cases may be re-tested later to complete interface certification without repeating the entire test suite. Similarly, if an LSMS/SOA developer has made minor modifications to their software, they may re-test only the impacted functionality to verify compliance.

E. Interconnection Testing

Interconnection testing is a pre-requisite to the second major phase of testing, turn-up testing, described below. Subsequent to initiating turn-up testing, data links are established between each carrier participating in turn-up testing and the Lockheed Martin NPAC data network. These links provide diverse access to both Lockheed Martin NPAC data centers, in Chicago and Tarrytown, NY. Turn-up testing may commence on low-speed dial-up links, which are subject to interconnection testing, typically lasting three to five business days. Upon commencing the "SP to SP" turn-up test phase described below, all carriers participating in a region are expected to have established permanent (so-called "nailed") data circuits to the NPAC network. These links are also subject to a three to five business day testing process. Once either dial-up

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LOCKHEED MARTIN

Geraldine A. Matise
March 23, 1998
Page Six

or nailed data link testing has been successfully completed on at least one data circuit, a carrier may commence with the turn-up testing phases.

Data circuits that carriers establish to the NPAC network may be used to provide access to NPAC services for any of the regions they may serve. Separate data circuits are not required on a per region basis. Consequently, interconnection testing is usually only needed for carriers who may not have previously connected to the NPAC as a result of turn-up testing already concluded in other regions.

F.   Turn-Up Testing

The second phase of the certification process is termed "Turn-up Testing". During this phase, the carrier connects his platform to a Lockheed Martin NPAC testbed system provided for that purpose. This testbed system does not interact in any way with any NPAC production systems that are currently in use. This phase of testing verifies the carrier's ability to correctly interact with the NPAC platform while attempting to perform all the functions that the carrier will need to perform during live NPAC operation. This testing is conducted by connecting the carrier's platform to the Lockheed Martin NPAC testbed system, typically using the same high-speed data circuits that the carrier intends to use for live operation. The test cases are executed by the carrier with the assistance and monitoring of a Lockheed Martin test engineer on a "one-to-one, real time" basis. There are currently 200 test cases defined in the turn-up test suite, however, a carrier may execute fewer than the complete 200 cases depending on his "category". These turn-up testing categories were established to avoid re-running test cases that were deemed to be required only on a "once per carrier" basis. The categories are defined as follows: A "new carrier" is one which has not previously undergone turn-up testing in a Lockheed Martin NPAC region. An "experienced" carrier has completed turn-up testing in one or more Lockheed Martin NPAC regions. "New carrier platform" is a hardware/software combination that has not previously undergone turn-up testing in a Lockheed Martin NPAC region. "Experienced carrier platform" is a hardware/software combination that has completed turn-up testing in one or more Lockheed Martin NPAC regions. In the following table, each of the four carrier/platform combinations are listed, with the number of turn-up test cases required for that category.

New carrier / New platform – 200 test cases
New carrier / Experienced platform – 140 test cases
Experienced carrier / New platform – 140 test cases
Experienced carrier / Experienced platform – 40 test cases

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Geraldine A. Matise
March 23, 1998
Page Seven

The turn-up testing process in its entirety includes some predecessor and successor requirements in addition to executing the individual test cases listed above. Prior to beginning execution of test cases the carrier must successfully establish data link connectivity with the NPAC, and perform some "initialization" steps such as exchange of encryption key lists. This connection establishment process typically takes 1 to 3 working days. After connectivity is established and an initial association (data channel) is brought up between the NPAC and the carrier the individual test cases described above are executed in sequence. The approximate time required for each of the categories described above is approximately 25 working days for the 200 case category, approximately 20 working days for the 140 test case category, and approximately 5 working days for the 40 test case category.

After completion of the individual turn-up test cases, the carrier being certified participates in the next phase of turn-up testing called the "SP to SP" phase. In this test scenario, the carrier being certified, and at least 2 other previously certified carriers all connect to the NPAC testbed and concurrently execute a series of 18 business scenarios devised to verify that the several carriers involved can successfully interact with the NPAC to accomplish typical LNP number porting exercises. At least one NPAC test engineer is assigned to support and monitor this test phase. This testing typically requires 3 working days to complete.

The final phase of the turn-up testing process requires the carrier being certified to connect their systems to the NPAC production platform for the region they are being certified in. If the turn-up testing being conducted for the region is the first such testing, by this point in the schedule Lockheed Martin will have deployed the production systems to be used in live service for that region. In the case of the three new regions currently in turn-up testing, Lockheed Martin is on schedule to deploy the final production systems by approximately April 16, 1998. This milestone is effectively the NPAC delivery date, the date at which the production systems for a region are available for industry testing.

After successfully establishing connectivity and bringing up an initial association with the production NPAC for the region, the carrier is required to complete a "fail-over" scenario with the NPAC which verifies their ability to connect to the Lockheed Martin backup NPAC site in Tarrytown N.Y., continue operation while connected there, then successfully "fail back" to the primary NPAC production facility in Chicago. After the carrier has completed this "Disaster Recovery" test, they are considered to be qualified to remain attached to that Lockheed Martin regional NPAC and to fully participate in LNP porting activities.

The turn-up testing process is performed in two different circumstances. Once, when a new region is being tested and activated for the first time, and again, for each

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Geraldine A. Matise
March 23, 1998
Page Eight

L O C K H E E D   M A R T I N

carrier that subsequently enters an NPAC region once the NPAC for that region has already been designated as live. In the first case, turn-up testing is conducted with a number of carriers in parallel. Under terms of the master agreements with each of the LLCs, an NPAC is designated as "live" for a new region once successful turn-up testing has been completed involving at least one incumbent carrier and two other carriers (*e.g.*, CLECs). In the case of an additional carrier entering a region after the NPAC is live, the turn-up testing is conducted with that carrier. When entering the "SP to SP" phase of testing, one or more other carriers already live with the NPAC for that region may volunteer to participate in the "SP to SP" testing with the new carrier.

We are currently on schedule to complete turn-up testing for the West Coast and Western regions for a May 11, 1998, NPAC Live date. The turn-up schedule for the Southeast region has not been finalized pending one carrier's development schedule to complete a necessary update of their system software to IIS release 1.8.

G.   Network Testing

After one or more carriers have completed the turn-up testing requirements described above and the NPAC is designated as live, these carriers will typically wish to conduct a "Field Trial/Network Testing" phase prior to beginning live porting of actual customers in an NPAC region, or a new MSA within that region. This "Field Trial" phase is defined, organized, and conducted by the carriers in the particular NPAC region with minimal assistance from Lockheed Martin test engineers. At this point the NPAC system is considered to be in live operation, and the field trial testing conducted by the carriers is supported by NPAC user support analysts in the same fashion that live customer operation is supported. The primary purpose of this phase of testing is to provide one or more carriers in a region with a final opportunity to completely test end-to-end LNP number porting. Typically a group of test switches and exchanges (NPA-NXXs) are opened for porting in the region. The carriers participating in the network test will transfer test customer numbers from one carrier to another, to include all necessary downstream and other network element provisioning necessary to prove that the number has been fully ported and tested.

The network testing phase may take approximately 4-8 working weeks to complete for the first MSA activated in a region. Note that a "mini field trial" will typically be conducted when a new MSA is opened for number portability within a region that is already in live porting status. These intervals are very rough averages. In Lockheed Martin's experience, the actual amount of testing varies substantially by carrier, MSA, and region. A number of factors influence the amount of testing time applied, including the number of participating carriers, the number of test switches and

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LOCKHEED MARTIN

Geraldine A. Matise
March 23, 1998
Page Nine

exchanges involved, the amount of pair-wise carrier-to-carrier testing versus collective testing of portions of the test plan, and the amount of parallelism in the schedule.

We emphasize that Lockheed Martin is only tangentially involved in the network testing, as the NPAC services it delivers are otherwise live at this point, and the amount of support Lockheed Martin provides is consequently limited to the LNP administration functions involving the NPAC. We describe the network testing phase here only to provide a context for the testing involving Lockheed Martin and the NPAC, and to clarify the role of the NPAC-related milestones in the overall context of activating LNP in a region.

H.   Regression Testing

It should be noted that the process described above constitutes the steps required of a new carrier that wishes to connect to a Lockheed Martin NPAC region for LNP. After initial certification is achieved by a carrier, it, or Lockheed Martin, may elect to perform additional testing as may be required to assure ongoing successful interoperation with the NPAC. Usually this additional testing will be associated with installation of new or revised hardware or software by either the carrier or Lockheed Martin. When this occurs, a mutually agreed upon suite of regression tests will be run by the carrier while attached to a Lockheed Martin NPAC testbed. After successful execution of the prescribed regression test suite, the revised hardware/software will be installed into the production SP platforms and the Lockheed Martin production NPAC platforms following a mutually agreed installation schedule.

Pursuant to Section 1.1206(b) of the Commission's rules, an original and one copy of this transmittal letter are being submitted to the Office of the Secretary for inclusion in the public record.

Best regards,

Joseph F. Franlin
Vice President, Operations
Communications Industry Services
Lockheed Martin IMS

cc: Marion Gordon
    Andre Rausche
    Gayle Teicher
    Leslie Selzer

Geraldine A. Matise
March 23, 1998
Page Ten

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